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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/520,385	01/03/2005	Takashi Ishii	20239/0202029-US0	2540
7278	7590	01/10/2006		EXAMINER
DARBY & DARBY P.C. P. O. BOX 5257 NEW YORK, NY 10150-5257				MATTHEWS, COLLEEN ANN
			ART UNIT	PAPER NUMBER
				2811

DATE MAILED: 01/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	10/520,385	ISHII ET AL.
	Examiner Colleen A. Matthews	Art Unit 2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### **Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)  Responsive to communication(s) filed on 03 January 2005.

2a)  This action is **FINAL**.                            2b)  This action is non-final.

3)  Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## **Disposition of Claims**

4)  Claim(s) 1-10 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5)  Claim(s) \_\_\_\_\_ is/are allowed.

6)  Claim(s) 1-10 is/are rejected.

7)  Claim(s) \_\_\_\_\_ is/are objected to.

8)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

9)  The specification is objected to by the Examiner.

10)  The drawing(s) filed on \_\_\_\_\_ is/are: a)  accepted or b)  objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)  The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a)  All    b)  Some \* c)  None of:  
1.  Certified copies of the priority documents have been received.  
2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3.  Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)  Notice of References Cited (PTO-892)  
2)  Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3)  Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/3/2005.

4)  Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5)  Notice of Informal Patent Application (PTO-152)  
6)  Other: \_\_\_\_\_.

## DETAILED ACTION

### *Drawings*

1. Figure 4 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. An understanding of theoretical density is critical to the making of the invention because the limits set forth in claim 1 require specific percentages of

theoretical densities for the invention. However, an understanding of the usage of theoretical density is not described within the specification.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-5, 7-8 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by applicants' acknowledged prior art (APA) of Figure 4.

5. Regarding claims 1 as far as an indefinite claim can be understood and claim 2, APA of Figure 4 discloses a solder layer (108) formed on a primary surface of a submount substrate (4f) where the density of the solder layer before melting is at least 50% and no more than 99.9% of the theoretical density of the material used in the solder layer and where the solder layer contains at least one of the following: gold-tin alloy, silver-tin alloy, or lead-tin alloy. It is the examiners position that as long as there is a solder layer containing one of the following: gold-tin alloy, silver-tin alloy or lead-tin alloy, that the solder layer will have the required theoretical density because it is comprised of the same material and under the same conditions the material should

behave in the same manner. APA discloses use of gold-tin, silver-tin and lead-tin alloys for the solder layer (specification page 2 lines 18-20).

6. Regarding claim 3, the solder layer before melting describes an intermediate product of the submount assembly, which cannot serve to structurally distinguish the claimed submount from APA of Figure 4.

7. Regarding claim 4, APA of Figure 4 discloses a submount (3) having an electrode layer (6) formed between the submount substrate (4) and the solder layer (108).

8. Regarding claim 5, APA discloses the electrode layer containing gold (specification page 2 lines 1-2).

9. Regarding claim 7, APA of Figure 4 discloses an adhesion layer (5) and a diffusion barrier layer (5) formed between the submount substrate and the solder layer where the adhesion layer is formed on the primary surface of the submount substrate (4f) and the diffusion barrier is formed on the adhesion layer (specification page 1 lines 22-23 and page 2 line 1).

10. Regarding claim 8, APA of Figure 4 discloses an adhesion layer contains titanium and diffusion layer contains platinum (specification page 1 lines 22-23 and page 2 line 1).

11. Regarding claim 10, APA of Figure 4 discloses a semiconductor device comprising a submount (3) and a semiconductor light-emitting element (2) mounted on the solder layer (108) of the submount.

***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over by applicants' acknowledged prior art (APA) of Figure 4 in view of U.S. Pat. No. 6,521,477 to Gooch et al.

14. Regarding claim 6, the APA of Figure 4 differs from the claimed invention in not disclosing the solder adhesion layer (107) containing a noble metal layer disposed on the solder layer side and containing at least one of the following gold, platinum, palladium, and a transition element layer disposed on the electrode layer side containing at least one of titanium, vanadium, chromium, zirconium, niobium. Gooch et al. teaches a solder adhesion layer in Figure 7 where the adhesion layer is comprised of a combination of metals or metal alloys, preferably a first layer of titanium, followed by a layer of palladium (column 6 lines 21-27). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a combination of metals or metal alloys such as a layer of titanium followed by a layer of palladium as in Gooch et al. as the solder adhesion layer between the solder layer and the electrode layer in the APA of Figure 4. One would have been motivated to modify the solder adhesion layer to have two layers of metal

in order to provide a surface for the solder that is better suited for secure attachment of a device.

15. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over by applicants' acknowledged prior art (APA) of Figure 4 in view of U.S. Pat. No. 4,585,706 to Takeda et al.
16. Regarding claim 9, the APA of Figure 4 differs from the claimed invention in not disclosing the submount substrate containing sintered aluminum nitride or sintered alumina. Takeda et al. teaches a submount substrate (20) containing sintered aluminum nitride (claim 1 in column 10). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a submount substrate containing sintered aluminum nitride or sintered alumina as in Takeda et al. as the material for the submount substrate in the APA of Figure 4. One would have been motivated to modify the material of the submount substrate to sintered aluminum nitride or sintered in order to make a compact substrate that is electrically insulating, heat-resistant, and has a high mechanical strength at high temperature.

### ***Conclusion***

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patent and publication are cited to further show the state of the art with respect to submounts for semiconductor devices in general:

U.S. Pat. No. 5,990,560 to Coulter et al. discusses solder bonds and layers.

U.S. Pat. No. 6,876,008 to Bhat et al. discusses solder containing a first layer of silver and a second layer of tin.

U.S. Pat. No. 6,961,357 to Moriya et al. discusses an aluminum nitride submount with gold-tin solder for mounting an LED.

U.S. Pub. No. 2005/0205875 to Shei et al. discusses light-emitting diode substrates.

U.S. Pat. No. 5,479,029 to Uchida et al. discusses a submount with electrode layer between the submount and LED device.

U.S. Pub. No. 2003/0015721 to Slater et al. discusses a submount with solder layer to mount an LED.

U.S. Pat. No. 6,696,103 to Shimoda et al. discusses sintered aluminum nitride submounts.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen A. Matthews whose telephone number is 571-272-1667. The examiner can normally be reached on Monday - Friday 8AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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12/01/2005



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